

CLAIMS

What is claimed is:

1. A method for synchronizing access points in a wireless local area network to enable a seamless transfer of a mobile device in the wireless local area network, communications in the wireless local area network being based on a plurality of timing patterns, the method comprising the computer implemented steps of:
 - 5 synchronizing a second access point having a second timing pattern of the plurality of timing patterns with an initial access point having an initial timing pattern of the plurality, the second access point adjusting the second timing pattern to match the initial timing pattern to produce a synchronized second timing pattern for use by the second access point;
 - 10 synchronizing a third access point having a third timing pattern of the plurality of timing patterns with the second access point, by adjusting the third timing pattern to match the synchronized second timing pattern of the second access point to produce a synchronized third timing pattern for use by the third access point; and
 - 15 transferring a connection for the mobile device by transferring an initial link between the mobile device and the initial access point to a transferred link between the mobile device and the third access point to provide for the seamless transfer of the mobile device as a function of synchronization of the initial access point with the third access point based on the initial timing pattern and the synchronized third timing pattern.
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2. The method of Claim 1, wherein the initial access point, the second access point, and the third access point form a set of synchronized access points; and wherein
25 the method further comprises steps of:

providing further access points in the wireless local area network; and

synchronizing each further access point with one of the synchronized access points so that each further access point joins the set of synchronized access points to enable the seamless transfer of the mobile device from any one of the set of synchronized access points to any other one of the set of synchronized access points.

3. The method of Claim 1, wherein the wireless local area network includes a first piconet designated as a top level in a hierarchy of piconets and a second piconet designated as a second level in the hierarchy, and

wherein the initial access point has a master role for the first piconet, the second access point has a slave role in the first piconet, the second access point has a master role for the second piconet concurrently with having the slave role in the first piconet, and the third access point has a slave role in the second piconet.

4. The method of Claim 3, wherein:

the second access point has a first set of timing registers controlling a slave clock phase for the slave role in the first piconet, and a second set of timing registers controlling a master clock phase for the master role in the second piconet; and

the method further includes a step of transferring a clock offset value from the first set of timing registers to the second set of timing registers to synchronize the slave role in the first piconet with the master role in the second piconet.

5. The method of Claim 3, wherein the timing patterns are based on time slots and wherein the second access point performs a plurality of further slave roles in the first piconet in a first set of time slots available to the second access point, and the second access point performs a plurality of further master roles for further piconets in a second set of time slots selected from time slots available to the second access point exclusive of the first set of time slots.
6. The method of Claim 1, wherein the method further includes a step of eliminating guard periods in transmissions of the second access point based on performing the steps of synchronizing the initial access point with the second access point and synchronizing the third access point with the second access point.
7. The method of Claim 1, wherein the step of transferring the connection for the mobile device is performed at a transfer rate that supports substantially uninterrupted voice communication to the mobile device from a voice communication source through the first access point and through the third access point during the step of transferring.
8. The method of Claim 7, wherein the transfer rate is less than about 80 milliseconds.
9. The method of Claim 1, wherein the step of synchronizing the second access point includes receiving at the second access point a first timing beacon provided by the initial access point, and the step of synchronizing the third access point includes receiving at the third access point a second timing beacon provided by the second access point.

10. The method of Claim 8, wherein the wireless local area network is based on a spread-spectrum wireless communications protocol.

11. A gateway server for synchronizing access points in a wireless local area network to enable a seamless transfer of a mobile device in the wireless local area network, communications in the wireless local area network being based on a plurality of timing patterns, the gateway server comprising:

a communication interface for communicating with an initial access point, a second access point, and a third access point; the initial access point having an initial timing pattern of the plurality of timing patterns, the second access point having a second timing pattern of the plurality, and the third access point having a third timing pattern of the plurality; and

a digital processor coupled to the communication interface, the digital processor hosting and executing a gateway application that configures the digital processor to:

direct the second access point to synchronize with the initial access point, the second access point adjusting the second timing pattern to match the initial timing pattern to produce a synchronized second timing pattern for use by the second access point;

direct the third access point to synchronize with the second access point, the third access point adjusting the third timing pattern to match the synchronized second timing pattern of the second access point to produce a synchronized third timing pattern for use by the third access point; and

to perform a connection transfer of an initial link between the mobile device and the initial access point to a transferred link between the mobile device and the third access point to provide for the seamless transfer of the mobile device as a function of synchronization of the

initial access point with the third access point based on the initial timing pattern and the synchronized third timing pattern.

12. The gateway server of Claim 11, wherein the initial access point, the second access point, and the third access point form a set of synchronized access points; and wherein the wireless local area network comprises further access points; and the gateway application configures the digital processor to instruct each further access point to synchronize with one of the synchronized access points so that each further access point joins the set of synchronized access points to enable the seamless transfer of the mobile device from any one of the set of synchronized access points to any other one of the set of synchronized access points.

13. The gateway server of Claim 11, wherein the wireless local area network includes a first piconet designated as a top level in a hierarchy of piconets and a second piconet designated as a second level in the hierarchy, and

wherein the initial access point has a master role for the first piconet, the second access point has a slave role in the first piconet, the second access point has a master role for the second piconet concurrently with having the slave role in the first piconet, and the third access point has a slave role in the second piconet.

14. The gateway server of Claim 13, wherein:
the second access point has a first set of timing registers controlling a slave clock phase for the slave role in the first piconet, and a second set of timing registers controlling a master clock phase for the master role in the second piconet; and

the gateway application configures the digital processor to instruct the second access point to transfer a clock offset value from the first set of timing

registers to the second set of timing registers to synchronize the slave role in the first piconet with the master role in the second piconet.

15. The gateway server of Claim 13, wherein the timing patterns are based on time slots and wherein the gateway application configures the digital processor to instruct the second access point to perform a plurality of further slave roles in the first piconet in a first set of time slots available to the second access point, and to instruct the second access point to perform a plurality of further master roles for further piconets in a second set of time slots selected from time slots available to the second access point exclusive of the first set of time slots.
- 10 16. The gateway server of Claim 11, wherein the gateway application configures the digital processor to instruct the second access point to eliminate guard periods in transmissions of the second access point based on synchronizing the initial access point with the second access point and synchronizing the third access point with the second access point.
- 15 17. The gateway server of Claim 11, wherein the gateway application configures the digital processor to perform the connection transfer for the mobile device at a transfer rate that supports substantially uninterrupted voice communication to the mobile device from a voice communication source through the first access point and through the third access point during the connection transfer.
- 20 18. The gateway server of Claim 17, wherein the transfer rate is less than about 80 milliseconds.
19. The gateway server of Claim 11, wherein the gateway application configures the

digital processor to instruct the second access point to receive a first timing beacon provided by the initial access point, and to instruct the third access point to receive a second timing beacon provided by the second access point.

20. The gateway server of Claim 19, wherein the wireless local area network is
5 based on a spread-spectrum wireless communications protocol.
21. A system for synchronizing access points in a wireless local area network to enable a seamless transfer of a mobile device in the wireless local area network, communications in the wireless local area network being based on a plurality of timing patterns, the system comprising:
- 10 a second access point in communication with an initial access point, the second access point for synchronizing the second access point with the initial access point, the initial access point having an initial timing pattern of the plurality of timing patterns, the second access point having a second timing pattern of the plurality and adjusting the second timing pattern to match the
- 15 initial timing pattern to produce a synchronized second timing pattern for use by the second access point;
- a third access point in communication with the second access point, the third access point for synchronizing the third access point with the second access point, the third access point having a third timing pattern of the plurality of timing patterns and adjusting the third timing pattern to match the synchronized
- 20 second timing pattern of the second access point to produce a synchronized third timing pattern for use by the third access point; and
- a gateway server in communication with the initial access point, the second access point, and the third access point, the gateway server for
- 25 performing a connection transfer of an initial link between the mobile device and the initial access point to a transferred link between the mobile device and the

third access point to provide for the seamless transfer of the mobile device as a function of synchronization of the initial access point with the third access point based on the initial timing pattern and the synchronized third timing pattern.

22. The system of Claim 21, wherein the initial access point, the second access point, and the third access point form a set of synchronized access points; and wherein the wireless local area network comprises further access points; and
- each further access point synchronizes with one of the synchronized access points so that each further access point joins the set of synchronized access points to enable the seamless transfer of the mobile device from any one of the set of synchronized access points to any other one of the set of synchronized access points.
23. The system of Claim 21, wherein the wireless local area network includes a first piconet designated as a top level in a hierarchy of piconets and a second piconet designated as a second level in the hierarchy, and
- wherein the initial access point has a master role for the first piconet, the second access point has a slave role in the first piconet, the second access point has a master role for the second piconet concurrently with having the slave role in the first piconet, and the third access point has a slave role in the second piconet.
24. The system of Claim 23, wherein:
- the second access point has a first set of timing registers controlling a slave clock phase for the slave role in the first piconet, and a second set of timing registers controlling a master clock phase for the master role in the second piconet; and

the second access point transfers a clock offset value from the first set of timing registers to the second set of timing registers to synchronize the slave role in the first piconet with the master role in the second piconet.

- 5 25. The system of Claim 23, wherein the timing patterns are based on time slots and wherein the second access point performs a plurality of further slave roles in the first piconet in a first set of time slots available to the second access point, and the second access point performs a plurality of further master roles for further piconets in a second set of time slots selected from time slots available to the second access point exclusive of the first set of time slots.
- 10 26. The system of Claim 21, wherein the second access point eliminates guard periods in transmissions of the second access point based on synchronizing the initial access point with the second access point and synchronizing the third access point with the second access point.
- 15 27. The system of Claim 21, wherein the gateway server performs the connection transfer for the mobile device at a transfer rate that supports substantially uninterrupted voice communication to the mobile device from a voice communication source through the first access point and through the third access point during the connection transfer.
- 20 28. The system of Claim 27, wherein the transfer rate is less than about 80 milliseconds.
29. The system of Claim 21, wherein the second access point receives a first timing beacon provided by the initial access point, and the third access point receives a

second timing beacon provided by the second access point.

30. The system of Claim 29, wherein the wireless local area network is based on a spread-spectrum wireless communications protocol.
31. A computer program product that includes a computer usable medium having
5 computer program instructions stored thereon for synchronizing access points in a wireless local area network to enable a seamless transfer of a mobile device in the wireless local area network, communications in the wireless local area network being based on a plurality of timing pattern, such that the computer program instructions, when performed by a digital processor, cause the digital
10 processor to:
- synchronize a second access point having a second timing pattern of the plurality of timing patterns with an initial access point having an initial timing pattern of the plurality, by adjusting the second timing pattern to match the initial timing pattern to produce a synchronized second timing pattern for use by
15 the second access point;
 - synchronize a third access point having a third timing pattern of the plurality of timing patterns with the second access point, by adjusting the third timing pattern to match the synchronized second timing pattern of the second access point to produce a synchronized third timing pattern for use by the third
20 access point; and
 - transfer a connection for the mobile device by transferring an initial link between the mobile device and the initial access point to a transferred link between the mobile device and the third access point to provide for the seamless transfer of the mobile device as a function of synchronization of the initial
25 access point with the third access point based on the initial timing pattern and the synchronized third timing pattern.